Proximal Hypospadias: Meeting the promise to our patients

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Moscow, Russia
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Goals for Hypospadias Surgery

- Void with laminar flow
  - Without spraying
- Sexual function
  - Straight, adequate penile length
- Good cosmetic outcome
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• Void with laminar flow
  – Without spraying
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***5-12% complication rate for distal hypospadias
***We are often able to achieve distal placement of a slit-like meatus
Proximal hypospadias: bad outcomes
CHOP Hypospadias 1996 - 2006

- 665 complete charts reviewed
- Median age at surgery: 8.5 mo (2.3 - 196.1)
- Median f/u: 6.2 months (0 - 122.1)
- Complications: any deviation requiring surgical correction
  - Fistula, meatal stenosis, & diverticula
• 665 complete charts were available for review

• Median age at surgery: 8.5 mo (2.3 - 196.1)

• Median f/u: 6.2 months (0 - 122.1)

• Complications: any deviation requiring surgical correction
  – Fistula, meatal stenosis, & diverticula
Overall complication rate → 113/665 (17%)

- The more severe the hypospadias, the higher the likelihood of post operative complications
  - Distal/midshaft 74/579 (12%)
  - Proximal hypospadias 39/86 (45%), \(p < 0.0001\)

- Dilutional effect: complication rate decreased by grouping severe with distal variants
Why are our results optimistic?

Better results

- Shorter follow up
- More distal repairs
- Less curvature

Worse results

- Longer follow up
- More proximal repair
- More curvature

Since > 85% of hypospadias patients are distal and we don’t wait long enough to publish, we tend to quote more optimistic results to our colleagues, patients and families.
Length of follow up

- 1061 hypospadias procedures in 543 boys
  - 360/543 (78%) Distal
  - 54/543 (11%) Midshaft
  - 54/543 (11%) Proximal

- Median f/u: 34mo

- Complication rate 114/543 (24%)

Spinoit *J Urol* 2013
Length of follow up

Distal/Midshaft hypospadias

Proximal hypospadias

Spinoit J Urol 2013
Length of follow up

- Single institution, Thiersh-Duplay repairs
- 517/578 (90%) patients with distal hypospadias
- Mean f/u 25.6mo

Figure 1  Distribution of patients with and without complications according to the length of follow-up.

Grossos J Ped Urol 2014
Length of follow up

- 170 complications
  - 97/170 (53%) ≤ 1yr
  - 73/170 (47%) >1yr

- Median follow up:
  - YES complication: 45.8 mo
  - NO complication: 5.2mo

- This is with DISTAL repairs

Figure 1  Distribution of patients with and without complications according to the length of follow-up.
What is the complication rate for proximal hypospadias?
## What is the TRUE complication rate for proximal hypospadias?

<table>
<thead>
<tr>
<th>Institution</th>
<th># patients</th>
<th>Procedure</th>
<th>Follow up</th>
<th>Complication rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas Children’s</td>
<td>56</td>
<td>2-stage repair, Byars flap</td>
<td>34 mo</td>
<td>68%</td>
</tr>
<tr>
<td>Boston Children’s</td>
<td>134</td>
<td>2-stage repair, Byars flap</td>
<td>40 mo</td>
<td>53%</td>
</tr>
<tr>
<td>Toronto</td>
<td>140</td>
<td>Long TIP Dorsal Inlay 2-stage repair</td>
<td>30-48 mo</td>
<td>61% 52% 38%</td>
</tr>
<tr>
<td>CHOP</td>
<td>168</td>
<td>Single stage 2-Stage</td>
<td>31mo 29 mo</td>
<td>62% 43%</td>
</tr>
<tr>
<td>PARC Urology</td>
<td>43</td>
<td>Bracka</td>
<td>18 mo</td>
<td>23%</td>
</tr>
</tbody>
</table>
Why is the complication rate higher for proximal hypospadias?
Tissue hypoplasia/dysplasia

- Shorter penile length in adults when matched to control patients¹
- Curvature can worsen during puberty²
- Elastography analysis³:
  - Corpus spongiosum is stiffer
  - Corpus cavernosum less developed

¹Moriya W J Urol 2016
²Ekmark Eur J Ped Surg 2013
³Comoglio J Ped Urol 2016
Recurrence curve – 5/35 (14.2%) at last F/U

- Reoperation VL – 3
- 1- dura graft (palpable induration)
- 1- penoscrotal transposition - significant skin tethering
- 1 No intervention – mild VC due to midline closure and skin tethering
Under correction and/or assessment of penile curvature

• We need to objectively measure curvature

• What is the best approach to correcting penile curvature?

• We towards over correction (getting it just right) vs under correction: do not fear the staged repair
Length of Urethroplasty


Fig. 2. Schematic representation of possible flow dynamics of neourethra following TIP vs onlay repair for penoscrotal hypospadias. A, penoscrotal TIP neourethra is longer than for coronal TIP repair. B, in absence of neourethral stenosis (usually responsible for common distal fistulas) Poiseille’s law predicts high resistance in longer tube, and may explain proximal fistula after TIP repair. C, in more distensible (8Fr or greater during voiding) onlay neourethra made from skin would predict less resistance as well as bell-shaped flow curve.
Length of Urethroplasty

Longer tubes = more resistance

Greater effect of narrowing


Fig. 2. Schematic representation of possible flow dynamics of neourethra following TIP vs onlay repair for penoscrotal hypospadias. A, penoscrotal TIP neourethra is longer than for coronal TIP repair. B, in absence of neourethral stenosis (usually responsible for common distal fistulas), Ponceau's law predicts high resistance in longer tube, and may explain proximal fistula after TIP repair. C, in more distensible (8Fr or greater during voiding) onlay neourethra made from skin would predict less resistance as well as bell-shaped flow curve.
Hypospadias cripple (Grade V hypospadias)

- 14 operations to date

- Significant tissue loss, psychological effect?

- What will be his ultimate cosmetic and functional outcome?
Hypospadias cripple (Grade V hypospadias)

• 14 operations to date

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Single stage repair N=87</th>
<th>Planned 2 stage repair N=81</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cripple risk</td>
<td>7 (8%)</td>
<td>2 (2%)</td>
</tr>
</tbody>
</table>

cosmetic and functional outcome?
How can we improve?

- Measure
- Improve
- Assess
- Patient feedback
- Collaboration
- Coaching
- Record procedures
- Improve
- Measure
- Assess
Hypospadias Measurements
How we have modified our hypospadias management at CHOP

• Standardization of measurements:
  – Pre-operative workup
  – Intraoperative assessment
  – Post-op assessment

• Follow up algorithm
  – Immediate post-op period, after toilet-training
  – Extension through puberty
    • Difficulties with contact information
  – Patient reported outcome questionnaire
    • Erectile function, voiding function, cosmesis

• Prospective database for objective analysis of outcomes
Hypospadias Measurements

**G (Glans/Urethral Plate Score)**
1. Above average glans size; healthy urethral plate; deeply grooved
2. Average glans size; adequate urethral plate; grooved
3. Small glans; urethral plate narrow with some fibrosis; flat
4. Very small glans; urethral plate indistinct; very narrow or flat

**M (Meatus Score)**
1. Glanular
2. Coronal sulcus
3. Distal or mid-shaft
4. Proximal shaft, penoscrotal or perineal

**S (Shaft Score)**
1. No chordee
2. Mild (<30 degree) chordee
3. Moderate (30-60 degree) chordee
4. Severe (>60 degree) chordee

Figure 1: The Glans-Urethral Meatus Shaft scoring criteria.

Name of the patient:
Date of birth:
Relevant personal details:

1. Site of urethral meatus (before chordee correction)
   - Glanular
   - Distal
   - Proximal

2. Site of urethral meatus (after chordee correction)
   - Chordee

3. Prepuce
   - Complete
   - Incomplete

4. Glans
   - Tight
   - Incomplete

5. Chordee
   - No chordee
   - Superficial
   - Deep
Objectifying the phenotype (severity)

- Location of urethral meatus
- Degree of penile curvature after de-gloving
- Glans width
- Length of urethroplasty
- Quality of urethral plate
- Quality of glans groove
Hypospadias Measurements

Objectifying the phenotype (severity)

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**Hypospadias Measurements**

<table>
<thead>
<tr>
<th>Urethral Closure Technique</th>
<th>Neourethra:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>{suture size: 24790}</td>
</tr>
<tr>
<td></td>
<td>{suture type: 24791}</td>
</tr>
</tbody>
</table>

- Urethra Closure: {urethra closure: 24793}

- Additional Layer(s) of Closure: {layers of closure: 24795}

- Total # of Layers of Closure: {No. Layers: 25592}

- Glans Closure:
  - {suture size: 25096}
  - {suture type: 25097}

<table>
<thead>
<tr>
<th>Stretched Penile Length (mm)</th>
<th>Dorsal Stretched Penile Length (as defined from NHIRD dataset)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Patient reported outcomes

Keys J Urol 2016

Van der Toorn J Ped Urol 2013
Patient reported outcomes

Keys *J Urol* 2016

Van der Toorn *J Ped Urol* 2013
• Musicians
• Athletes
• Writers
• Why not surgeons?
• Coaching
• Teleconferencing

Collaboration and Mentorship
How can we improve?

Measure → Improve → Record procedures → Measure

Collaboration → Coaching 

Assess → Patient feedback
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Can this be achieved for all patients?

Patient and family education **PRIOR** to the procedure

Tailor expectations for **EACH** patient
Conclusion

• Longer follow up is necessary to achieve maximum results for our hypospadias repairs

• Standardize functional assessment (urinary, sexual, cosmetic)

• Collaboration will be key